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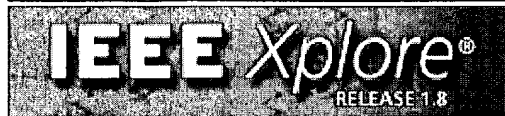
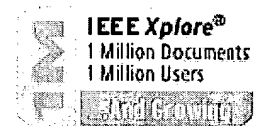
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*Dropsho, S.; Kursun, V.; Albonesi, D.H.; Dwarkadas, S.; Friedman, E.G.;*  
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### 2 Overview of complementary GaAs technology for high-speed VLSI circuits

*Brown, R.B.; Bernhardt, B.; LaMacchia, M.; Abrokwhah, J.; Parakh, P.N.; Basso, T.D.; Gold, S.M.; Stetson, S.; Gauthier, C.R.; Foster, D.; Crawforth, B.; McQuire, T.; Sakallah, K.; Lomax, R.J.; Mudge, T.N.;*  
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*Benes, M.; Wolfe, A.; Nowick, S.M.;*  
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*Partovi, H.; Burd, R.; Salim, U.; Weber, F.; DiGregorio, L.; Draper, D.;*  
Solid-State Circuits Conference, 1996. Digest of Technical Papers. 43rd ISSCC.,  
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**5 A 150-mW subscriber-line-board controller**

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**6 Low-power and high-speed ROM modules for ASIC applications**

*Ching-Rong Chang; Jinn-Shyan Wang; Cheng-Hui Yang;*  
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Pages:1516 - 1523

[\[Abstract\]](#) [\[PDF Full-Text \(304 KB\)\]](#) **IEEE JNL**

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**7 Capacitor coupling threshold logic**

*Jia, C.; Milor, L.; Huang, H.-Y.;*  
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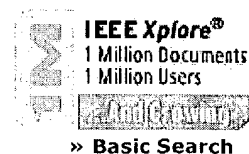
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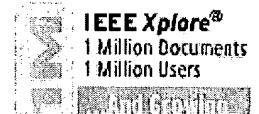
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## Hazard-free implementation of speed-independent circuits

[Kondratyev, A.](#) [Kishinevsky, M.](#) [Yakovlev, A.](#)

Aizu Univ., Japan;

*This paper appears in: Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on*

Publication Date: Sept. 1998

On page(s): 749 - 771

Volume: 17 , Issue: 9

ISSN: 0278-0070

Reference Cited: 43

CODEN: ITCSDI

Inspec Accession Number: 6041724

### Abstract:

This paper develops a theoretical framework for the hazard-free gate-level implementation of speed-independent circuits specified by event-based models, such as signal transition graphs (for processes with AND causality and input choice) or their extension, called change diagrams (which allow OR-causality). It presents sufficient conditions, called the generalized monotonous cover requirements, for a hazard-free circuit to be built within a standard implementation structure. This structure consists of two-level simple-gate combinational logic and a row of latches, either a C-element or an RS-latch. A set of semantic-preserving transformations is defined that can be applied to an original behavioral description of the circuit so as to produce its specification in the form that satisfies the monotonous cover requirement. The transformations are applied at the event-based representation level (to avoid state explosion) and proved to be effective. The main result of the paper is therefore twofold: 1) the proof that any speed-independent behavior can be implemented at the gate level without hazards and 2) an efficient method for constructing such an implementation. Experimental results show that the proposed method compares very favorably, in area and performance, to the previously known techniques

### Index Terms:

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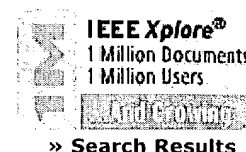
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Benes, R.; Nowick, S.M.; Wolfe, A.;

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van Dyck, R.E.; Miller, D.J.;

Proceedings of the IEEE , Volume: 87 , Issue: 10 , Oct. 1999  
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*Laneman, J.N.; Sundberg, C.-E.W.; Faller, C.;*  
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**5 Applications of asynchronous circuits**

*Van Berkel, C.H.; Josephs, M.B.; Nowick, S.M.;*  
Proceedings of the IEEE , Volume: 87 , Issue: 2 , Feb. 1999  
Pages:223 - 233

[\[Abstract\]](#) [\[PDF Full-Text \(252 KB\)\]](#) [IEEE JNL](#)

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**6 Fast heuristic and exact algorithms for two-level hazard-free logic minimization**

*Theobald, M.; Nowick, S.M.;*  
Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on , Volume: 17 , Issue: 11 , Nov. 1998  
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[\[Abstract\]](#) [\[PDF Full-Text \(1172 KB\)\]](#) [IEEE JNL](#)

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**7 Expression-tree-based algorithms for code compression on embedded RISC architectures**

*Araujo, G.; Centoducatte, P.; Azevedo, R.; Pannain, R.;*  
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Pages:530 - 533

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**8 Joint source/channel coding for variable length codes**

*Sayood, K.; Otu, H.H.; Demir, N.;*  
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**9 LZW-based code compression for VLIW embedded systems**

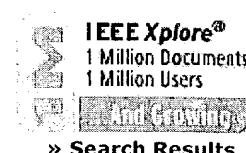
*Chang Hong Lin; Yuan Xie; Wolf, W.;*  
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Pages:76 - 81

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#### 1 Relative timing [asynchronous design]

*Stevens, K.S.; Ginosar, R.; Rotem, S.;*

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Pages:129 - 140

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Circuits and Systems for Video Technology, IEEE Transactions on , Volume: 9 , Issue: 8 , Dec. 1999

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[\[Abstract\]](#)   [\[PDF Full-Text \(228 KB\)\]](#)   **IEEE JNL**

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[\[Abstract\]](#)   [\[PDF Full-Text \(412 KB\)\]](#)   **IEEE JNL**

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**5 An asynchronous instruction length decoder**

*Stevens, K.S.; Rotem, S.; Ginosar, R.; Beerel, P.; Myers, C.J.; Yun, K.Y.; Koi, R.; Dike, C.; Roncken, M.;*

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**6 Chain: a delay-insensitive chip area interconnect**

*Bainbridge, J.; Furber, S.;*

Micro, IEEE , Volume: 22 , Issue: 5 , Sept.-Oct. 2002

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**8 A seventh-generation x86 microprocessor**

*Golden, M.; Hesley, S.; Scherer, A.; Crowley, M.; Johnson, S.C.; Meier, S.; Meyer, D.; Moench, J.D.; Oberman, S.; Partovi, H.; Weber, F.; White, S.; Wood, T.; Yong, J.;*

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**9 Power management in the Amulet microprocessors**

*Furber, S.B.; Efthymiou, A.; Garside, J.D.; Lloyd, D.W.; Lewis, M.J.G.; Temple, S.;*

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**10 Coming challenges in microarchitecture and architecture**

*Ronen, R.; Mendelson, A.; Lai, K.; Shih-Lien Lu; Pollack, F.; Shen, J.P.;*

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**13 A self-timed real-time sorting network**

*Yun, K.Y.; James, K.W.; Fairlie-Cunninghame, R.H.; Chakraborty, S.; Cruz, R.L.;*  
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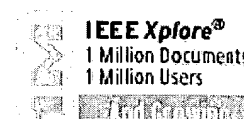
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### 1 A fast asynchronous Huffman decoder for compressed-code embedded processors

*Benes, R.; Nowick, S.M.; Wolfe, A.;*

Advanced Research in Asynchronous Circuits and Systems, 1998. Proceedings.

1998 Fourth International Symposium on , 30 March-2 April 1998

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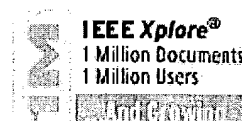
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16 **A result forwarding mechanism for asynchronous pipelined systems**

*Gilbert, D.A.; Garside, J.D.;*

Advanced Research in Asynchronous Circuits and Systems, 1997. Proceedings., Third International Symposium on , 7-10 April 1997

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17 **ASYNMPU: a fully asynchronous CISC microprocessor**

*Tse, J.M.C.; Lun, D.P.K.;*

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18 **Synchronous implementation of a counterflow pipeline processor**

*Janik, K.J.; Shih-Lien Lu;*

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19 **A CMOS floating point multiplier**

*Uya, M.; Kaneko, K.; Yasui, J.;*

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**20 The design of an asynchronous TinyRISC™ TR4101 microprocessor core**  
*Christensen, K.T.; Jensen, P.; Korger, P.; Sparso, J.;*  
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1998 Fourth International Symposium on , 30 March-2 April 1998  
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**21 Writing sequential programs for parallel processors: implementation experience**  
*Subramonian, R.;*  
Computing and Information, 1992. Proceedings. ICCI '92., Fourth International  
Conference on , 28-30 May 1992  
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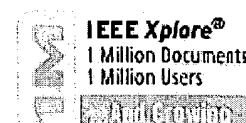
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## 1 Shaping codes constructed from cost-constrained graphs

McLaughlin, S.W.; Khayrallah, A.S.;

Information Theory, IEEE Transactions on , Volume: 43 , Issue: 2 , March 1997

Pages:692 - 699

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## 2 Digital television on ATM networks: optimum chain for coding and transmission

Leduc, J.-P.;

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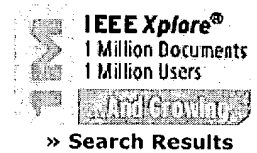
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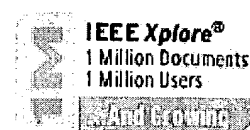
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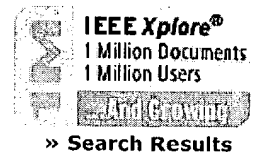
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### 1 Lazy transition systems and asynchronous circuit synthesis with relative timing assumptions

*Cortadella, J.; Kishinevsky, M.; Burns, S.M.; Kondratyev, A.; Lavagno, L.; Stevens, K.S.; Taubin, A.; Yakovlev, A.;*

Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on , Volume: 21 , Issue: 2 , Feb. 2002

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**16 Asynchronous datapath with software-controlled on-chip adaptive voltage scaling for multirate signal processing applications**

*Yee William Li; Patounakis, G.; Jose, A.; Shepard, K.L.; Nowick, S.M.;*

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**17 Analysis of blocking dynamic circuits**

*Thorp, T.; Liu, D.;*

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*Naffziger, S.D.; Colon-Bonet, G.; Fischer, T.; Riedlinger, R.; Sullivan, T.J.; Grutkowski, T.;*

Solid-State Circuits, IEEE Journal of , Volume: 37 , Issue: 11 , Nov. 2002

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**2 The design and verification of a high-performance low-control-overhead asynchronous differential equation solver**

*Yun, K.Y.; Beerel, P.A.; Vakilotojar, V.; Dooply, A.E.; Arceo, J.;*

Very Large Scale Integration (VLSI) Systems, IEEE Transactions on , Volume: 6 , Issue: 4 , Dec. 1998

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*Beiu, V.; Quintana, J.M.; Avedillo, M.J.;*

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**4 A 2/spl times/ load/store pipe for a low-power 1-GHz embedded processor**

*Zongjian Chen; Murray, D.; Nishimoto, S.; Pearce, M.; Oyker, M.; Rodriguez, D.;*

*Rogenmoser, R.; Dongwook Suh; Supnet, E.; von Kaenel, V.R.; Yiu, G.;*

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**6 Timing analysis of asynchronous systems using time separation of events**

*Chakraborty, S.; Yun, K.Y.; Dill, D.L.;*

Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on , Volume: 18 , Issue: 8 , Aug. 1999

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